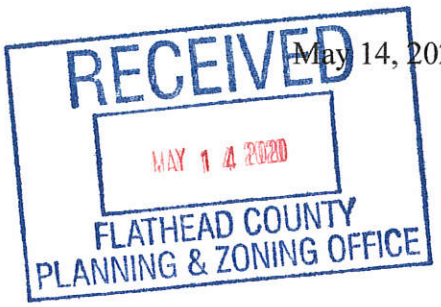
FRASER MANAGEMENT & CONSULTING, PLLC.
690 NORTH MERIDIAN, SUITE 103
KALISPELL, MT. 59901

Flathead County Planning and Zoning Office
Attn: Eric Mack
40 11th Street W., Ste. 220
Kalispell, MT 59901

May 14, 2020



RE: Saint Herman Subdivision

Dear Eric,

Enclosed is a Traffic Impact Study (TIS), completed by WGM Group, for the Saint Herman Subdivision. The enclosed information addresses concerns by the public and Planning Board at the public meeting.

On August 14th, 2019 the required public hearing was held for the proposed St. Herman subdivision. Many members of the community spoke during the time allotted for public comment and voiced various concerns regarding the subdivision. A primary concern voiced was regarding traffic impacts on Morning View Road and at the intersections with West Valley Drive and at Highway 2 at West Valley Drive.

There is no zoning in place for the property and larger West Valley area. Zoning determines permitted uses. A single lot subdivision could have been submitted and evaluated based on residential use. St. Herman's, wanting to be forth right, submitted an application for the church.

After the public hearing was closed, the Planning Board deliberated over the various concerns regarding the subdivision, mainly the traffic issue. A TIS was not required for the preliminary plat application as traffic volumes are less than 300 vehicle trips per day, actually about half. The Board concluded a traffic study with current traffic counts, history of crash data and estimates of peak hour traffic would have addressed any misinformation and safety concerns. Based on the concerns raised during public comment and lack of data from a TIS, the planning board tabled the project pending additional information. The planning staff supported the Board discussion on a traffic study being a mechanism to address public and Board concerns.

The enclosed TIS is a detailed traffic and safety analysis of the intersections of Morning View Road and West Valley Drive and West Valley Drive and Highway 2. The TIS includes numerous charts, data, traffic counts and discussion. Conclusions of the TIS are summarized on Page 16 of the document, as follows:

- *The congregation of Saint Herman Church proposes to construct a new church building of approximately 5,750 square feet.*
- *Vehicle access to the church will be via Morning View Drive.*
- *The proposed development will generate small amounts of new traffic through the study intersections. Highway Capacity Manual based analysis shows that this new traffic can be accommodated at the study intersections without the need for improvements. The study intersections will continue to operate at good levels of service during the Sunday hours addressed in this study.*

- *Review of 10 years of crash data at the study intersections did not identify any unusual crash trends, and the traffic that will be added by the church is not anticipated to impact the crash frequency or severity.*

- *No changes to the roadway network are required to accommodate the proposed church building.*

In addition to providing a TIS documenting the added traffic from the Church will not have a negative impact on intersections safety or cause delays in traffic movements, and to address public concerns voiced at the public hearing, St. Herman Orthodox Church is proposing to add to the plat conditions a statement requiring the "waiving the right to protest the creation of a rural improvements district for the purpose of making future improvements to the intersections of West Valley Drive, Highway Two and Morning View Roads". St. Herman's Orthodox Church understands concerns regarding traffic in a growing community and is willing to participate in a future, community wide effort to address these issues.

We are requesting the Planning Staff forward to the Flathead County Planning Board for consideration the enclosed information. When the Board meets and continues consideration we are requesting Findings of Fact #4 be amended to read, "The impact from the Church traffic will have a negligible effect on existing conditions at the intersections of Morning View and West Valley Drive and West Valley Drive and Highway 2. The Accident records for 10 years do not indicate any accident pattern." The Board may then consider a motion and recommendation to the Commissioners.

Please contact me with any questions.

Sincerely,

Michael W. Fraser, PE.

w/encl
cc: Father Daniel Kirk
Sean McFarland, PLS.

WGMGROUP

Saint Herman Orthodox Church

Traffic Impact Study

Kalispell, Montana

4/9/2020

MONTANA
MARK DANIEL BANCALE
15599 PE
LICENSED PROFESSIONAL ENGINEER

PTOE #4336
4/9/2020

Project No: 20-01-24

431 1st Avenue West, Kalispell, MT 59901 | OFFICE 406.728.4611 | EMAIL wgm@wgmgroup.com

CONTENTS

APPENDICES

INTRODUCTION

The congregation of Saint Herman Orthodox Church proposes to construct a new 5,750 square foot church building to be located on West Valley Drive near Kalispell, Montana (see **Figure 1**). A very preliminary site plan for the church property is shown in **Figure 2**. Final planning, funding, and construction of the building is expected to require some time and, as such, 2023 was selected as the analysis year for this traffic study.

This traffic impact study was prepared using standard traffic engineering techniques to forecast traffic volumes and operations at the study intersections. Capacity analysis is presented both with and without the traffic generated by the proposed church to determine what impact this traffic will have on intersection operations. Additionally, the intersection analysis includes a review of crash data and safety based on the existing geometry of the intersections.

The community and Flathead County Planning Board requested detailed traffic and safety analysis of the following two intersections:

1. Morning View Drive and West Valley Drive
2. Highway 2 and West Valley Drive

The analysis conducted for this report concludes that the subject development will not negatively impact traffic operations or safety at the study intersections and that these intersections will continue to operate at a good level of service. Upon review of 10 years of crash data received from MDT, as well as a review of the existing geometry and lane configurations, WGM Group did not identify any unusual crash trends at the study intersections. The traffic that will be added by the church is not anticipated to impact the crash frequency or severity.

FIGURE 1: SITE VICINITY MAP

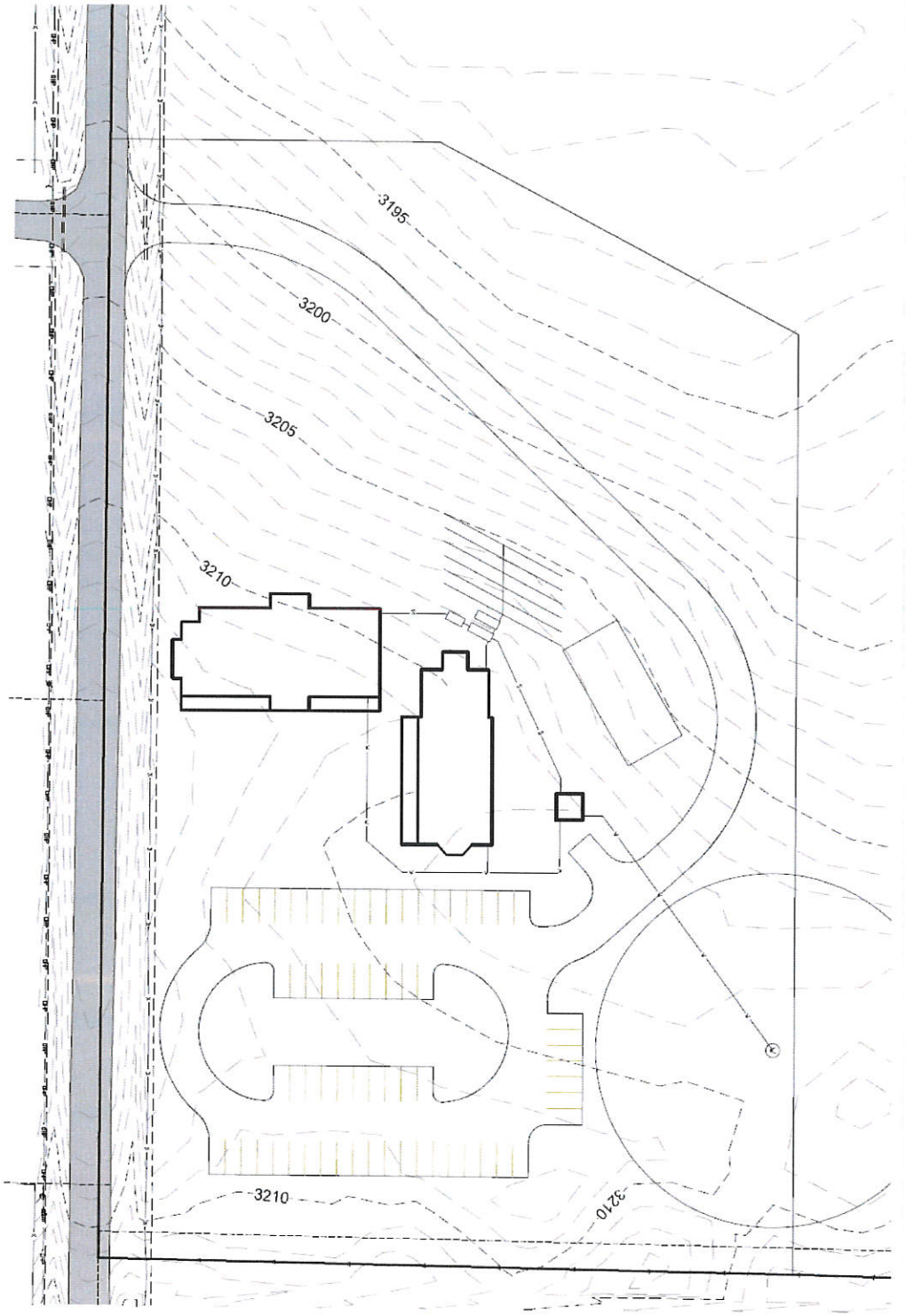


FIGURE 2: PRELIMINARY SITE PLAN

EXISTING TRAFFIC VOLUMES

WGM Group conducted manual intersection turning-movement counts on Sunday February 23, 2020 to identify existing traffic volumes at each of the study intersections. Sunday services at Saint Herman Church are conducted from 10:00 AM to noon. Traffic counts were conducted between 9:15 and 10:15 AM to capture the timeframe during which church traffic will be arriving, and between 11:45 and 12:45 PM to capture timeframe during which the church traffic will be exiting. For the purposes of this traffic study, these will be referred to as the "peak entering hour" and "peak exiting hour".

The count data (included in **Appendix A**) was analyzed to determine the existing traffic volume at each study intersection. These existing peak-hour traffic volumes are illustrated in **Figure 3**.

FIGURE 3: 2020 EXISTING PEAK HOUR TRAFFIC

2023 NO-BUILD TRAFFIC VOLUMES

The year 2020 existing traffic volumes were projected to the study year 2023 using a growth rate of 3% per year. This rate was calculated based on data from the Montana Department of Transportation (MDT) annual counts of total, two-way, average daily traffic (ADT) on US Highway 2 west of the US Highway 93 bypass.

The 2023 no-build traffic volumes are illustrated in **Figure 4**. These are the volumes projected to exist in the analysis year 2023 without construction of the Saint Herman Orthodox Church.

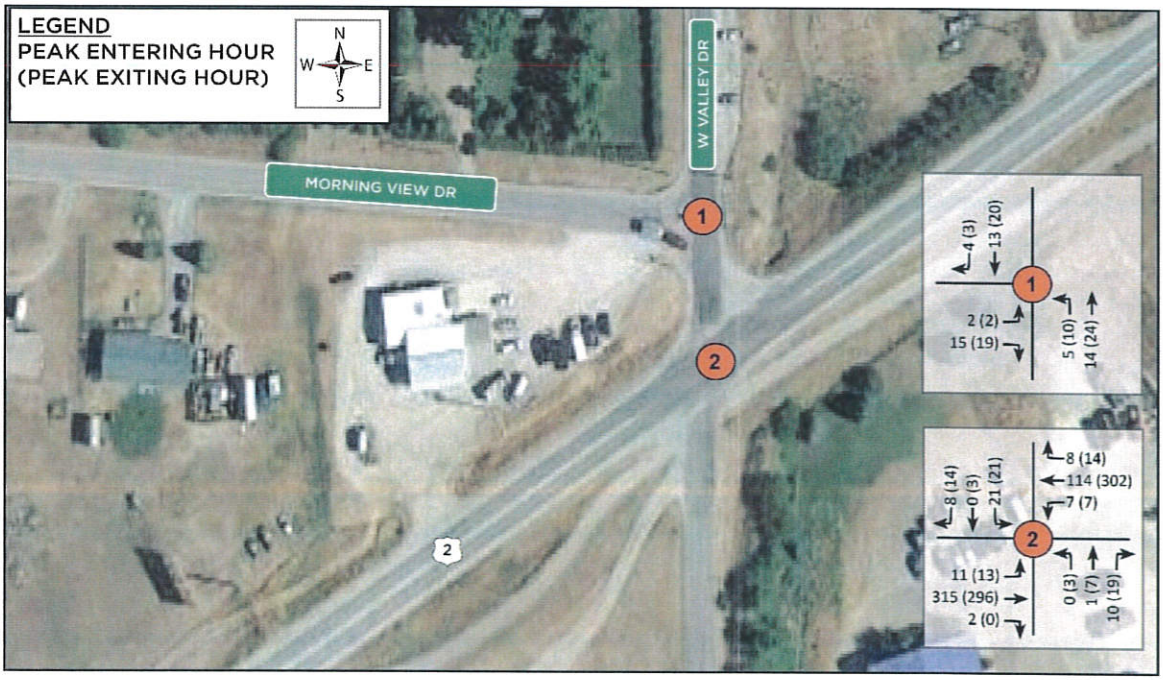


FIGURE 4: 2023 NO-BUILD PEAK HOUR TRAFFIC

SITE-GENERATED TRAFFIC

The Saint Herman Church building is anticipated to be approximately 5,750 square feet. Data from the Institute of Transportation Engineers (ITE) publication *Trip Generation* (10th Edition) was used to estimate the number of trips that will be generated by the proposed development. **Table 1** shows the results of these trip-generation calculations.

TABLE 1: SITE-GENERATED VEHICLE TRIPS

Land Use	Size	ITE Land Use Code	Peak Trips	
			Entering	Exiting
Church	5,750 SF	560	28	29

ASSIGNMENT OF SITE-GENERATED TRIPS

Roadway network connections were analyzed, the Kalispell area's population distribution was considered, and traffic volumes on the adjoining streets were reviewed to identify potential arrival and departure patterns for the site-generated traffic. The expected site arrival and departure patterns are illustrated in **Figure 5.**

The estimated site-generated vehicle trips from **Table 1** were distributed through the study intersections in accordance with the estimated arrival and departure patterns, resulting in the entering peak hour and exiting peak hour site-generated vehicle trips illustrated in **Figure 6**. These are the vehicle trips that are new to the roadway network as a direct result of the new Saint Herman Church meeting place.

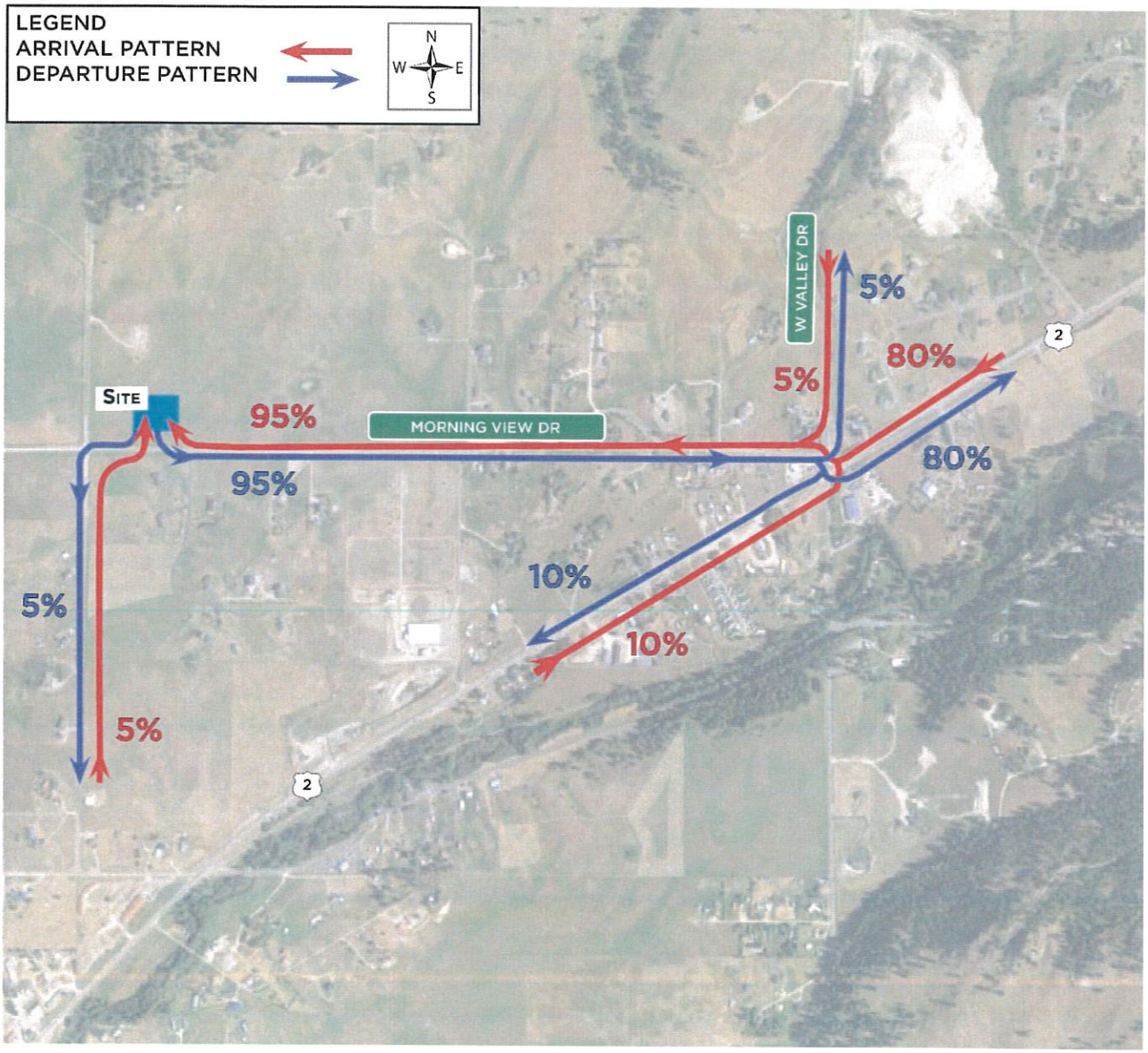


FIGURE 5: SITE ARRIVAL AND DEPATURE PEAK HOUR TRAFFIC PATTERNS

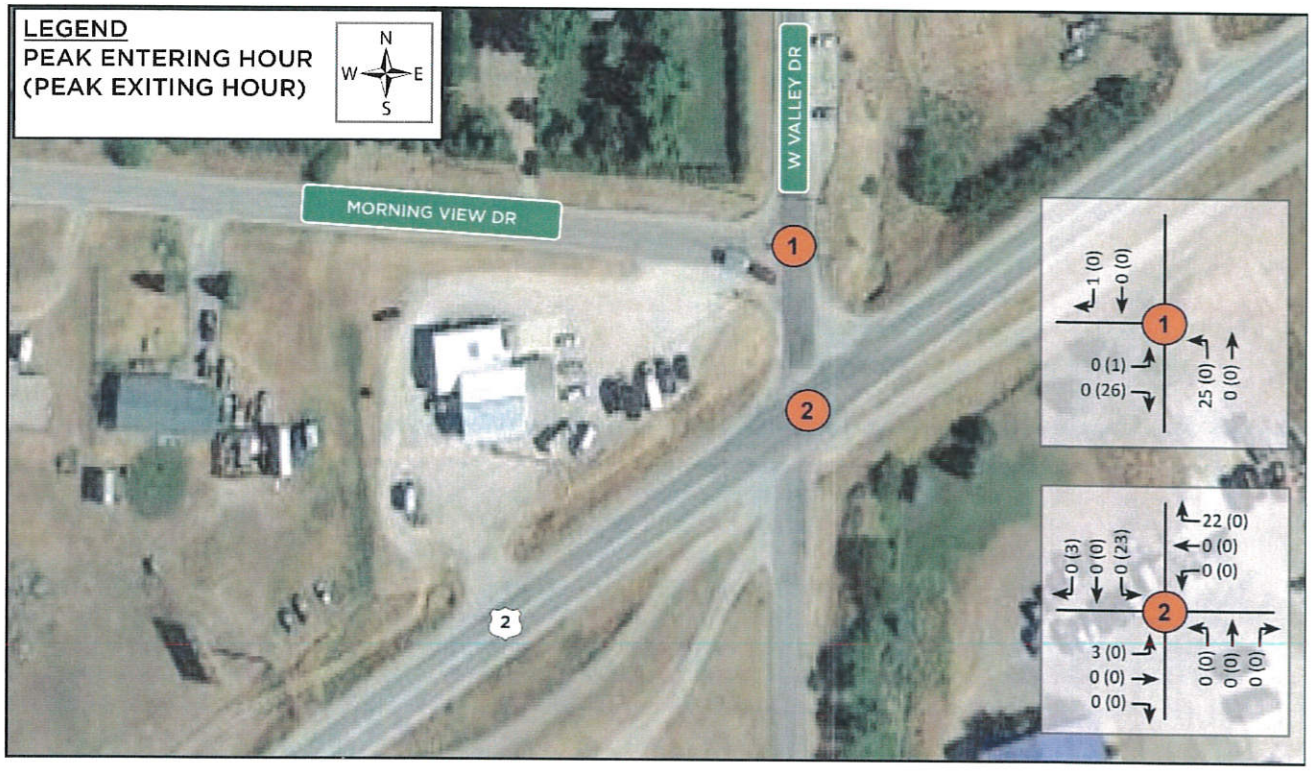


FIGURE 6: SITE GENERATED PEAK HOUR TRAFFIC

2023 BUILD TRAFFIC VOLUMES

Combining the site-generated trips from **Figure 6** with the 2023 no-build traffic volumes from **Figure 4** results in the projected study year 2023 build traffic volumes shown in **Figure 7**. These are the traffic volumes projected to exist at the study intersections when the proposed Saint Herman Church is constructed and in use.

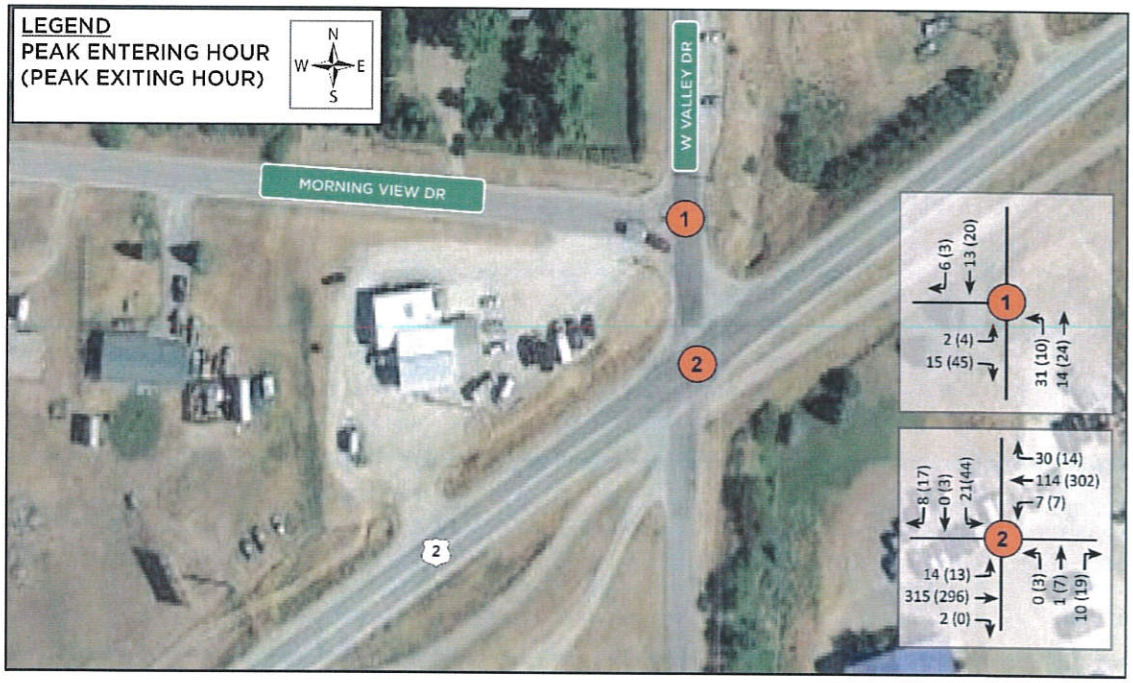


FIGURE 7: 2023 BUILD TRAFFIC VOLUMES

CAPACITY ANALYSIS

Capacity analysis was conducted for each of the study intersections in accordance with the procedures presented in the *Highway Capacity Manual*, 2010 Edition, published by the Transportation Research Board. The results of this analysis are discussed below, and the analysis worksheets are contained in **Appendix B**.

The capacity analysis procedures result in traffic level of service (LOS) rankings from A to F, with A representing essentially free-flow conditions and F representing congested conditions. See **Appendix C** for a description of the various LOS categories for unsignalized intersections.

INTERSECTION OF WEST VALLEY DRIVE AND MORNING VIEW DRIVE

EXISTING CONDITIONS

Morning View Drive is an east/west roadway with one travel lane in the eastbound direction that forms a T-intersection with West Valley Drive. Morning View Drive and West Valley Drive are both classified as local roadways.

The eastbound Morning View Drive approach to this intersection consists of a single lane for both left and right-turning vehicles and is stop-sign controlled. The southbound West Valley Drive approach consists of a single lane for both through and right-turning vehicles and is also stop-sign controlled. The northbound West Valley Drive approach consists of a single lane for both left-turning and through vehicles, and is the only approach at this intersection that is uncontrolled. The speed limits on West Valley Drive and Morning View Drive are 35 miles per hour.

CAPACITY ANALYSIS

Capacity analysis of this intersection was conducted using the 2023 no-build and build traffic volumes developed earlier in this report and the above-described intersection configuration. The results of this analysis are summarized in **Table 2**.

TABLE 2: WEST VALLEY DRIVE AND MORNING VIEW DRIVE LOS SUMMARY

	PEAK ENTERING HOUR				PEAK EXITING HOUR			
	2023 NO-BUILD		2023 BUILD		2023 NO-BUILD		2023 BUILD	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Eastbound Lt/Rt	9.0	A	9.0	A	9.0	A	9.2	A
Southbound Th/Rt	7.4	A	7.7	A	7.5	A	7.6	A

Delay is measured in seconds per vehicle.

The analysis summarized in **Table 2** shows that this intersection operates at a very good LOS "A" in both the no-build and build conditions. The traffic generated by Saint Herman Church will have no appreciable impact on delay or level of service and no capacity improvements are required to accommodate the site-generated traffic.

INTERSECTION OF US HIGHWAY 2 AND WEST VALLEY DRIVE

EXISTING CONDITIONS

US Highway 2 is an east/west principal arterial highway under the jurisdiction of MDT that traverses the entire width of Montana. At this intersection, US 2 has one travel lane in each direction and no turn lanes. West Valley Drive is a north/south roadway classified as a local roadway. It has one travel lane in each direction and single-lane, stop-controlled approaches to US Highway 2. The posted speed limit on US Highway 2 is 60 mph, and 35 mph on West Valley Drive.

CAPACITY ANALYSIS

Capacity analysis of this intersection was conducted using the 2023 no-build and build traffic volumes developed earlier in this report and the above-described intersection configuration. The results of this analysis are summarized in **Table 3**.

TABLE 3: US HIGHWAY 2 AND WEST VALLEY DRIVE LOS SUMMARY

	PEAK ENTERING HOUR				PEAK EXITING HOUR			
	2023 NO-BUILD		2023 BUILD		2023 NO-BUILD		2023 BUILD	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Northbound LT/Th/Rt	10.7	B	10.7	B	12.5	B	12.5	B
Southbound LT/Th/Rt	12.7	B	12.9	B	15.2	C	17.2	C

Delay is measured in seconds per vehicle.

The analysis summarized in **Table 3** shows that the site-generated traffic will result in very little additional delay at this intersection. Good level of service is maintained and no capacity improvements are required to accommodate the site-generated traffic.

CRASH ANALYSIS

Crash data for the ten-year period from January 1, 2009 to December 31, 2018 was obtained from the MDT Traffic and Safety Bureau for each of the study intersections. This data was reviewed to identify any crash trends that might be correctable.

At the US Highway 2 and West Valley Drive intersection there have been 17 crashes over the last 10 years, an average of 1.7 per year. Of these, eight were rear-end crashes, possibly indicating the need for a turn lane or lanes at the intersection. There were also three right-angle crashes, two wild animal crashes, and a small variety of other crash types. There was one fatality which occurred as part of a right-angle crash that occurred under clear/dry weather conditions during daylight hours.

The configuration of this intersection has some challenges such as the skewed approaches to US Highway 2, and the close proximity of a driveway intersection to the south and Morning View Drive to the north. Neither the Statewide Transportation Improvement Plan nor the Kalispell Area Transportation Plan anticipate improvements to this intersection.

At the Morning View Drive and West Valley Drive intersection, only one crash was reported in the 10-year period. This is a very low crash frequency. This crash was due to driver error, and was a hit and run crash. There are no safety improvements that can be recommended based on only one crash.

The few vehicles added to these intersections on a daily basis by the proposed Saint Herman Church are not anticipated to impact the crash frequency or severity. No safety improvements specific to this development are required.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The discussion and analyses contained in this report can be summarized as follows:

- The congregation of Saint Herman Church proposes to construct a new church building of approximately 5,750 square feet.
- Vehicle access to the church will be via Morning View Drive.
- The proposed development will generate small amounts of new traffic through the study intersections. *Highway Capacity Manual* based analysis shows that this new traffic can be accommodated at the study intersections without the need for improvements. The study intersections will continue to operate at good levels of service during the Sunday hours addressed in this study.
- Review of 10 years of crash data at the study intersections did not identify any unusual crash trends, and the traffic that will be added by the church is not anticipated to impact the crash frequency or severity.
- No changes to the roadway network are required to accommodate the proposed church building.

APPENDIX A

TRAFFIC COUNT DATA

Manual Traffic Count
Intersection of US Highway 2 and West Valley Drive
Kalispell, MT
Project # 20-01-24

$$PHF = \frac{V}{V_{15} * 4}$$

Sunday, February 23, 2020
Peak Entering Period

West Valley Drive and Morning View Drive

		Southbound West Valley Drive			Westbound US-2			Northbound West Valley Drive			Eastbound US-2			Interval	Hourly		**South Bound**	**Northbound**	**Eastbound**	
		Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Total	Total		Right	Left	Left	Right
9:15 AM	9:30 AM	2	0	5	2	19	2	1	0	0	0	74	2	107			1	1	1	4
9:30 AM	9:45 AM	0	0	6	2	26	2	1	0	0	0	71	2	110			0	1	0	4
9:45 AM	10:00 AM	4	0	2	2	29	2	5	1	0	1	56	3	105			1	3	1	1
10:00 AM	10:15 AM	1	0	6	1	30	0	2	0	0	1	87	3	131	453	<-- Peak Hour	2	0	0	5
	Peak Hour Volume	7	0	19	7	104	6	9	1	0	2	288	10				4	5	2	14

PHF = **0.86**

Sunday, February 23, 2020
Peak Exiting Period

West Valley Drive and Morning View Drive

		Southbound West Valley Drive			Westbound US-2			Northbound West Valley Drive			Eastbound US-2			Interval	Hourly		**South Bound**	**Northbound**	**Eastbound**	
		Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Total	Total		Right	Left	Left	Right
11:45 AM	12:00 PM	5	2	2	4	58	0	11	2	1	0	68	5	158			0	4	0	2
12:00 PM	12:15 PM	2	1	2	3	70	2	3	0	0	0	71	1	155			2	1	1	2
12:15 PM	12:30 PM	1	0	5	4	60	1	0	2	1	0	70	2	146			0	3	0	5
12:30 PM	12:45 PM	5	0	10	2	88	3	3	2	1	0	62	4	180	639	<-- Peak Hour	1	1	1	8
	Peak Hour Volume	13	3	19	13	276	6	17	6	3	0	271	12				3	9	2	17

PHF = **0.89**

APPENDIX B

CAPACITY ANALYSIS WORKSHEETS

HCS7 Two-Way Stop-Control Report

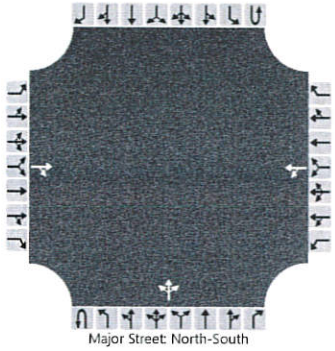
General Information

Analyst	BMS
Agency/Co.	WGM Group
Date Performed	3/18/2020
Analysis Year	2023
Time Analyzed	Peak Entering Hr No Build
Intersection Orientation	North-South
Project Description	Saint Herman Church TIS

Site Information

Intersection	Morning View &W Valley Dr
Jurisdiction	
East/West Street	Morning View Dr
North/South Street	West Valley Dr
Peak Hour Factor	0.86
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	0	0
Configuration				TR		LT					LTR					
Volume (veh/h)			2	15		13	4			5	0	14				
Percent Heavy Vehicles (%)			2	2		2	2			2						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)			6.5	7.1		7.1	6.5			5.3						
Critical Headway (sec)			6.52	7.12		7.12	6.52			5.32						
Base Follow-Up Headway (sec)			4.0	3.9		3.5	4.0			3.1						
Follow-Up Headway (sec)			4.02	3.92		2.22	4.02			3.12						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				20		20				6						
Capacity, c (veh/h)				919		1530				1155						
v/c Ratio				0.02		0.01				0.01						
95% Queue Length, Q_{95} (veh)				0.1		0.0				0.0						
Control Delay (s/veh)				9.0		7.4				8.1						
Level of Service (LOS)				A		A				A						
Approach Delay (s/veh)	9.0				7.4				2.2							
Approach LOS	A				A											

HCS7 Two-Way Stop-Control Report

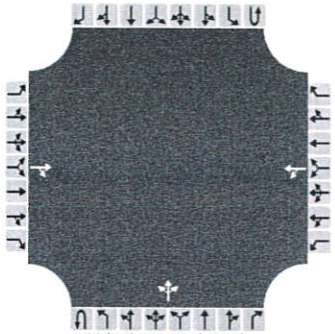
General Information

Analyst	BMS
Agency/Co.	WGM Group
Date Performed	3/18/2020
Analysis Year	2023
Time Analyzed	Exiting Peak Hr No Build
Intersection Orientation	North-South
Project Description	Saint Herman Church TIS

Site Information

Intersection	Morning View &W Valley Dr
Jurisdiction	
East/West Street	Morning View Dr
North/South Street	West Valley Dr
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	0	0
Configuration				TR		LT					LTR					
Volume (veh/h)			2	19		20	3			10	0	24				
Percent Heavy Vehicles (%)			2	2		2	2			2						
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)			6.5	7.1		7.1	6.5			5.3						
Critical Headway (sec)			6.52	7.12		7.12	6.52			5.32						
Base Follow-Up Headway (sec)			4.0	3.9		3.5	4.0			3.1						
Follow-Up Headway (sec)			4.02	3.92		2.22	4.02			3.12						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				24		26				11						
Capacity, c (veh/h)				919		1477				1155						
v/c Ratio				0.03		0.02				0.01						
95% Queue Length, Q_{95} (veh)				0.1		0.1				0.0						
Control Delay (s/veh)				9.0		7.5				8.1						
Level of Service (LOS)				A		A				A						
Approach Delay (s/veh)		9.0				7.5				2.5						
Approach LOS		A				A										

HCS7 Two-Way Stop-Control Report

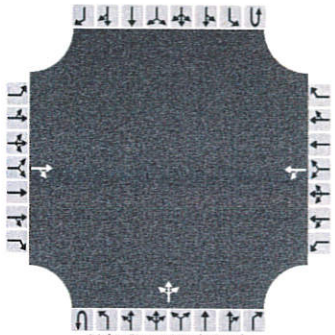
General Information

Analyst	BMS
Agency/Co.	WGM Group
Date Performed	3/18/2020
Analysis Year	2023
Time Analyzed	Entering Peak Hour Build
Intersection Orientation	North-South
Project Description	Saint Herman Church TIS

Site Information

Intersection	Morning View &W Valley Dr
Jurisdiction	
East/West Street	Morning View Dr
North/South Street	West Valley Dr
Peak Hour Factor	0.86
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	0	0
Configuration				TR		LT					LTR					
Volume (veh/h)			2	15		13	6			31	0	14				
Percent Heavy Vehicles (%)			2	2		2	2			2						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)			6.5	7.1		7.1	6.5			5.3						
Critical Headway (sec)			6.52	7.12		7.12	6.52			5.32						
Base Follow-Up Headway (sec)			4.0	3.9		3.5	4.0			3.1						
Follow-Up Headway (sec)			4.02	3.92		2.22	4.02			3.12						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				20		22				36						
Capacity, c (veh/h)				919		1355				1155						
v/c Ratio				0.02		0.02				0.03						
95% Queue Length, Q_{95} (veh)				0.1		0.0				0.1						
Control Delay (s/veh)				9.0		7.7				8.2						
Level of Service (LOS)				A		A				A						
Approach Delay (s/veh)	9.0				7.7				5.7							
Approach LOS	A				A											

HCS7 Two-Way Stop-Control Report

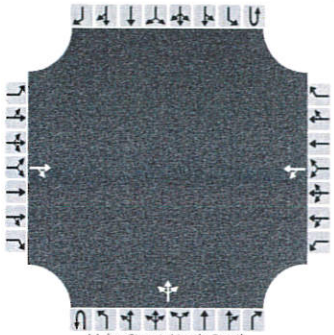
General Information

Analyst	BMS
Agency/Co.	WGM Group
Date Performed	3/18/2020
Analysis Year	2023
Time Analyzed	Exiting Peak Hour Build
Intersection Orientation	North-South
Project Description	Saint Herman Church TIS

Site Information

Intersection	Morning View &W Valley Dr
Jurisdiction	
East/West Street	Morning View Dr
North/South Street	West Valley Dr
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	0	0
Configuration				TR		LT					LTR					
Volume (veh/h)			4	45		20	3			10	0	24				
Percent Heavy Vehicles (%)			2	2		2	2			2						
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)			6.5	7.1		7.1	6.5			5.3						
Critical Headway (sec)			6.52	7.12		7.12	6.52			5.32						
Base Follow-Up Headway (sec)			4.0	3.9		3.5	4.0			3.1						
Follow-Up Headway (sec)			4.02	3.92		2.22	4.02			3.12						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				55		26				11						
Capacity, c (veh/h)				919		1426				1155						
v/c Ratio				0.06		0.02				0.01						
95% Queue Length, Q_{95} (veh)				0.2		0.1				0.0						
Control Delay (s/veh)				9.2		7.6				8.1						
Level of Service (LOS)				A		A				A						
Approach Delay (s/veh)		9.2				7.6				2.5						
Approach LOS		A				A										

HCS7 Two-Way Stop-Control Report

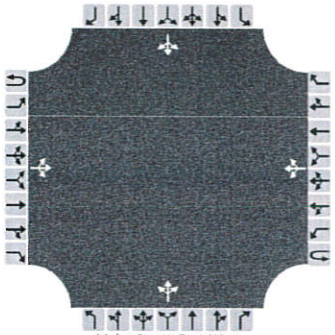
General Information

Analyst	BMS
Agency/Co.	WGM Group
Date Performed	3/17/2020
Analysis Year	2023
Time Analyzed	Entering Peak Hr No Build
Intersection Orientation	East-West
Project Description	Saint Herman Church TIS

Site Information

Intersection	HWY 2 & West Valley Drive
Jurisdiction	
East/West Street	HWY 2
North/South Street	West Valley Dr
Peak Hour Factor	0.86
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		11	315	2		7	114	8		0	1	10		21	0	8
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		13				8					13				34	
Capacity, c (veh/h)		1441				1189					645				502	
v/c Ratio		0.01				0.01					0.02				0.07	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.2	
Control Delay (s/veh)		7.5				8.0					10.7				12.7	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.3				0.5				10.7				12.7			
Approach LOS									B				B			

HCS7 Two-Way Stop-Control Report

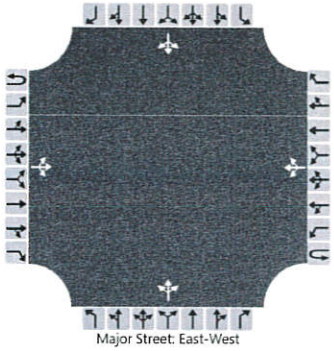
General Information

Analyst	BMS
Agency/Co.	WGM Group
Date Performed	3/17/2020
Analysis Year	2023
Time Analyzed	Exiting Peak Hr No Build
Intersection Orientation	East-West
Project Description	Saint Herman Church TIS

Site Information

Intersection	HWY 2 & West Valley Drive
Jurisdiction	
East/West Street	HWY 2
North/South Street	West Valley Dr
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		13	296	0		7	302	14		3	7	19		21	3	14
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		15				8					33				43	
Capacity, c (veh/h)		1204				1226					511				395	
v/c Ratio		0.01				0.01					0.06				0.11	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.4	
Control Delay (s/veh)		8.0				8.0					12.5				15.2	
Level of Service (LOS)		A				A					B				C	
Approach Delay (s/veh)	0.5				0.2				12.5				15.2			
Approach LOS									B				C			

HCS7 Two-Way Stop-Control Report

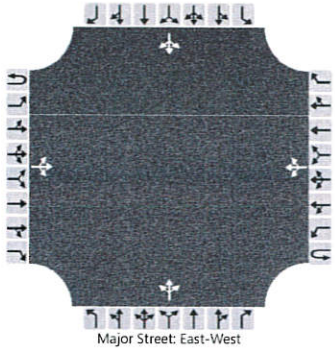
General Information

Analyst	BMS
Agency/Co.	WGM Group
Date Performed	3/17/2020
Analysis Year	2023
Time Analyzed	Entering Peak Hour Build
Intersection Orientation	East-West
Project Description	Saint Herman Church TIS

Site Information

Intersection	HWY 2 & West Valley Drive
Jurisdiction	
East/West Street	HWY 2
North/South Street	West Valley Dr
Peak Hour Factor	0.86
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		14	315	2		7	114	30		0	1	10		21	0	8
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		16				8					13				34	
Capacity, c (veh/h)		1410				1189					641				487	
v/c Ratio		0.01				0.01					0.02				0.07	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.2	
Control Delay (s/veh)		7.6				8.0					10.7				12.9	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.4				0.4				10.7				12.9			
Approach LOS									B				B			

HCS7 Two-Way Stop-Control Report

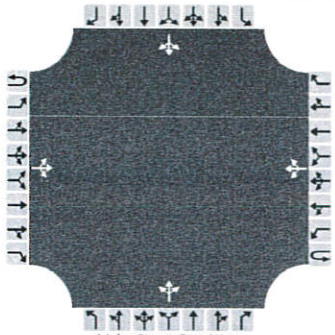
General Information

Analyst	BMS
Agency/Co.	WGM Group
Date Performed	3/17/2020
Analysis Year	2023
Time Analyzed	Exiting Peak Hour Build
Intersection Orientation	East-West
Project Description	Saint Herman Church TIS

Site Information

Intersection	HWY 2 & West Valley Drive
Jurisdiction	
East/West Street	HWY 2
North/South Street	West Valley Dr
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		13	296	0		7	302	14		3	7	19		44	3	17
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		15				8					33				72	
Capacity, c (veh/h)		1204				1226					510				367	
v/c Ratio		0.01				0.01					0.06				0.20	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.7	
Control Delay (s/veh)		8.0				8.0					12.5				17.2	
Level of Service (LOS)		A				A					B				C	
Approach Delay (s/veh)	0.5				0.2				12.5				17.2			
Approach LOS									B				C			

APPENDIX C

LEVEL OF SERVICE DEFINITIONS

UNSIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINED

Level of Service (LOS) for unsignalized (two-way-stop-controlled) intersections is determined by the control delay experienced by drivers on each minor approach. Minor movements are those entering from or exiting onto the stop-controlled side street(s). LOS is not defined for the intersection as a whole, but rather for each minor movement individually.

The delay value used in determining LOS is known as "control delay." Control delay is defined as the total delay experienced by a driver and includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The delay a vehicle experiences is a function of the capacity of the approach and the degree of saturation on the uncontrolled (unstopped) roadway (i.e. the number of acceptable gaps in the passing traffic stream).

LOS values range from A to F. The delay range for each LOS value is as shown in the following table.

LOS CRITERIA FOR TWO-WAY STOP-CONTROLLED INTERSECTIONS

LOS	AVERAGE CONTROL DELAY (SECONDS/VEHICLE)
A	0-10
B	>10-15
C	>15-25
D	>25-35
E	>35-50
F	>50

Source: Transportation Research Board, *Highway Capacity Manual*, HCM2010